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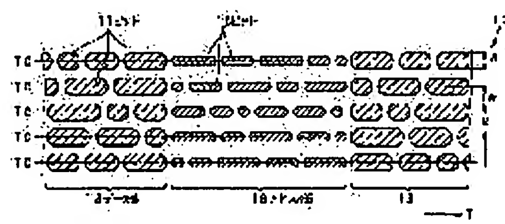
(71)Applicant : SONY CORP
(72)Inventor : WACHI SHIGEAKI

(54) OPTICAL RECORDING MEDIUM AND REPRODUCING DEVICE FOR THE SAME

(57)Abstract:
PURPOSE: To perform stable tracking servo while performing offset cancel by using a push-pull signal at an address part.

CONSTITUTION: The depth of a pit 11 of a data part 13 of an optical recording medium 10 is set within the range of λ/4n-λ/2n (where, the λ is the wavelength of a laser beam for reproducing and the (n) is the diffraction factor of a medium substrate) and the depth of a pit 16 in an address part 18 is set within the range of 0-λ/4n. When return light from the optical recording medium 10 is photodetected by a two-divided photodetecting element the difference signal of a detect signal obtained from each photodetecting part, namely, the polarity of the so-called push-pull signal is mutually inverted by the data part 13 and the address part 18.



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CLAIMS

[Claim(s)]
[Claim 1] In the optical recording medium which has either [at least] the pit record section where data were recorded with the gestalt of a pit, or the land record section where data are recorded on the land between the guide rails for tracking the return light of the light beam irradiated by the optical recording medium -- 2 division photo detector -- receiving light -- difference -- the optical recording medium characterized by preparing the above-mentioned pit or slot of two kinds of depth where the polarity according to the sense of a tracking gap of the push pull signal acquired from an output becomes reverse mutually, and changing.
[Claim 2] When setting the refractive index of the substrate of lambda and the above-mentioned optical recording medium to n for the wavelength of the above-mentioned light beam, it is the depth d1 of the class of one of the two above-mentioned kinds of pits, or a slot. It is referred to as 0<d1 <lambda / 4n, and is the depth d2 of the class of another side. Optical recording medium according to claim 1 characterized by being referred to as lambda/4 n<d2 <lambda / 2n.
[Claim 3] In the regenerative apparatus which reproduces the optical recording medium which has either [at least] the pit record section where data were recorded with the gestalt of a pit, or the land record section where data are recorded on the land between the guide rails for tracking 2 division photo detector which receives the return light of the light beam irradiated by the above-mentioned optical recording medium by the light sensing portion carried out 2 ****s, It has the subtraction means which takes out the push pull signal of the difference of the detecting signal from each light sensing portion of this 2 division photo detector as a tracking error signal. As the above-mentioned optical recording medium What prepares the above-mentioned pit or slot of two kinds of depths where the polarity according to the sense of a tracking gap of the push pull signal acquired from the output of a subtraction means becomes reverse mutually, and changes is used. The regenerative apparatus of the optical recording medium which carries out sample hold of one side of the output from the above-mentioned subtraction means about the return light to the pit or slot of the two above-mentioned kinds of depths, and is characterized by returning this sample hold output to an output from the above-mentioned subtraction means.
[Claim 4] When setting the refractive index of the substrate of lambda and the above-mentioned optical recording medium to n for the wavelength of the above-mentioned light beam, it is the depth d1 of the class of one of the two above-mentioned kinds of pits, or a slot. It is referred to as 0<d1 <lambda / 4n, and is the depth d2 of the class of another side. Regenerative apparatus of the optical recording medium according to claim 3 characterized by being referred to as lambda/4 n<d2 <lambda / 2n.
[Claim 5] In the regenerative apparatus which reproduces the optical recording medium which has either [at least] the pit record section where data were recorded with the gestalt of a pit, or the land record section where data are recorded on the land between the guide rails for tracking 2 division photo detector which receives the return light of the light beam irradiated by the above-mentioned optical recording medium by the light sensing portion carried out 2 ****s, It has the subtraction means which takes out the push pull signal of the difference of the detecting signal from each light sensing portion of

this 2 division photo detector as a tracking error signal. As the above-mentioned optical recording medium What prepares the above-mentioned pit or slot of two kinds of depths where the polarity according to the sense of a tracking gap of the push pull signal acquired from the output of a subtraction means becomes reverse mutually, and changes is used. The 1st and the 2nd sample hold means which carry out sample hold of the output from the above-mentioned subtraction means about the return light to the pit or slot of two kinds of these depths, respectively, The regenerative apparatus of the optical recording medium characterized by removing the direct-current-offset component which establishes an addition means to add the output from the these 1st and 2nd sample hold means, and is contained in an output signal from the above-mentioned subtraction means based on the output from this addition means.

[Translation done.]

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the regenerative apparatus of optical recording media, such as an optical disk and a magneto-optic disk, and an optical recording medium.
[0002]
[Description of the Prior Art] In optical recording media, such as an optical disk and a magneto-optic disk, what has the land record section where data are recorded on the land between the guide rails for tracking, the thing which has the pit record section where data were recorded with the gestalt of a pit, or the thing which has these both is known.
[0003] A laser beam is irradiated at such an optical recording medium, and the tracking servo control for carrying out position control of the beam spot to the core (the so-called truck center) of a recording track detects the location gap (the so-called tracking error) of a laser beam spot to a recording track, and is performed by moving a laser beam spot location so that this tracking error may be set to 0. The so-called push pull method is learned as one of the detection approaches of this tracking error. This push pull method obtains the above-mentioned tracking error by carrying out incidence of the return light reflected with the optical recording medium to the photo detector (photodetector) carried out 2 ****s, and taking the difference of the signal from each division light sensing portion.
[0004]
[Problem(s) to be Solved by the Invention] By the way, when making it move in the direction which intersects perpendicularly to an optical axis and carrying out the tracking only of the objective lens (for example, when using the so-called biaxial device), in case the describing [above] push pull method is used and tracking error detection is performed, as shown in drawing 9 , according to migration of the objective lens 104 which counters an optical recording medium 100 and is arranged, the beam spot will move also on 2 division photo detector (photodetector) 105, and direct current offset will appear in the push pull signal which is a tracking error signal. That is, when an objective lens 104 moves only delta x on drawing 9 , since optical reinforcement is large, by light sensing portion 105B, the detection quantity of light increases a beam core, and the quantity of light decreases in light sensing portion 105A. The detecting signal from these light sensing portions 105A and 105B will be sent to the differential amplifier (subtractor) 106, and a tracking error signal will be overlapped on the direct current offset by the above-mentioned optical-axis gap by taking difference.
[0005] In order to remove such direct current offset, various approaches can be considered and this applicant has proposed the tracking-error detection method of an optical head in JP,61-94246,A as the example. this technique -- setting -- the beam of a pair -- an objective lens -- minding -- an optical record medium -- receiving -- the abbreviation for that track pitch odd times the spacing of 1/2 -- with, you make it irradiate, and he carries out incidence of the outgoing radiation beam of the pair from the above-mentioned optical record medium to 2 division photo detector of a pair, respectively, and is trying to acquire a tracking error signal from the difference of each presenting force of each ****** output from 2 division photo detector of this pair Thus, by constituting, the tracking-error detecting signal (tracking

error signal) in which direct-current fluctuation (direct current offset) is hardly included can be obtained. However, it is necessary to irradiate for example, the 3 beam spots on an optical recording medium, and the point which should be improved [be / the burden to the laser diode which is a luminescence means is large, and / high power-ization of a laser diode etc. / needed] remains.
[0006] Moreover, performing offset cancellation of a tracking error signal is known by preparing the mirror section (mirror plane section) in an optical recording medium, detecting the direct current offset according to the amount of displacement of an objective lens, and subtracting this direct current offset from the push pull signal which is a difference signal of the detecting signal from each light sensing portion of 2 division photo detector as other examples of direct-current-offset removal, by detecting the reflected light from this mirror section by 2 division photo detector.
[0007] Here, drawing 10 shows the optical recording medium 110 of the type with which data are recorded with the gestalt of a pit (or a slot, a groove) 111. As an example of such an optical recording medium 110, the so-called ROM type of optical disk etc. is mentioned, for example, and a laser beam is scanned in the direction of a recording track (the direction of arrow-head T), performing tracking control which makes the location of the direction (the direction of tracking control) of arrow-head R of a laser beam in agreement with the core (the so-called truck center) TC of the pit 111 on a recording track at the time of playback of data. As the flat mirror section (mirror plane section) 115 which does not establish such a pit (a slot, groove) 111 in some recording tracks was formed and mentioned above, a part for direct current offset is taken out in this mirror section 115. In drawing 10 , the mirror section 115 is formed between the index area 116 and the data area 117. When an optical recording medium is a disk-like (disc-like), the above-mentioned tracking direction R supports in the direction of the diameter of a disk (the so-called radial direction), and the direction T of a truck supports the disk rotation tangential direction (the so-called tangential direction), respectively.
[0008] Moreover, drawing 11 shows the optical recording medium 120 of the type with which data are recorded on the land 122 between the guide rails 121 for tracking. As an example of such an optical recording medium 120, the so-called RAM media, such as an optical MAG (MO) disk, are mentioned, for example, and a laser beam is scanned in the direction of a recording track (the direction of arrow-head T), performing tracking control which makes the location of the direction (the direction of tracking control) of arrow-head R of the core of a laser beam in agreement with the core (the so-called truck center) TC of the land 122 which is a recording track at the time of record/playback of data. As a part of this guide rail 121 was not formed, the flat mirror section (mirror plane section) 125 is formed. Offset cancellation mentioned above using this mirror section 125 is performed. In drawing 11 , the mirror section 125 is arranged between the index area 126 where the pit (the so-called PURIPITTO) 123 was beforehand formed in the land 122 between guide rails 121, and a data storage area 127. In the case of a disk-like record medium, the above-mentioned tracking direction R corresponds in the direction of the diameter of a disk (the so-called radial direction), and the direction T of a truck corresponds in the disk rotation tangential direction (the so-called tangential direction), respectively.
[0009] Like the above-mentioned index area 126 grade, since the pit of the predetermined depth (for example, lambda/4) exists in the core of a groove, in the case of the optical recording medium corresponding to a tracking servo which performs offset cancellation using such the mirror section (115 and 125), defective parts, such as the so-called land slide, arise at the time of the media (disk etc.) manufacture using the so-called La Stampa etc., and pit formation is difficult for it. Moreover, since offset amendment in the above-mentioned mirror section is an addition method, gain doubling at the time of compounding with a push pull signal is difficult for it. Therefore, it is not suitable for fertilization, and highly [a medium price], the correspondence to the various media also as a drive of a regenerative apparatus, a record regenerative apparatus, etc. is difficult, and there is a fault which drive cost attaches highly.
[0010] By the way, as an example of further others of direct-current-offset removal, by detecting the reflected light from the mirror side established in the optical recording medium by 2 division detector, this artificer detected the amount of displacement of an objective lens, and has proposed the truck seeking method of record/playback optical disk which was made to carry out drive control of the thread

delivery motor which is a rough actuator according to this amount of displacement in JP,1-143086,A.
[0011] The dense actuator in which the rough actuator is equipped with the optical head which stands face to face against record/playback optical disk, and moves to radial in this truck seeking method constitutes. In case a target truck is sought, while supplying the jump signal which traverses the truck of a predetermined number to said dense actuator It integrates with the signal which detected the displacement location of said dense actuator, said rough actuator is supplied, and he follows said dense actuator, and is trying to move said dense actuator.
[0012] When the displacement location (position) signal of the above-mentioned dense actuator exceeds the level of a tracking error signal, unless it manages the phase of the above-mentioned position signal and a tracking error signal here, an unstable phenomenon which the objective lens of a biaxial device etc. stretches and attaches to an one direction may arise, and it is not desirable. This is with the case where tracking is carried out to the land between slots, and the case where tracking is carried out to a pit, and it is considered to be the cause that the relation between the polarity of the difference partial output of each part signal from the above-mentioned 2 division detector and the sense of the above-mentioned tracking gap is reversed.
[0013] This invention is made in view of such the actual condition, and when adopting a tracking control system which carries out offset cancellation by the so-called 1 spot push pull method, it aims at offer of the regenerative apparatus of the optical recording medium which can perform an extremely stable tracking servo with a sufficient precision with cheap equipment possible [low-pricing of an optical recording medium], and an optical recording medium.
[0014]
[Means for Solving the Problem] The pit record section where data were recorded with the gestalt of a pit in order that the optical recording medium concerning this invention might solve an above-mentioned technical problem, Or it sets to the optical recording medium which has at least one side of the land record section where data are recorded on the land between the guide rails for tracking. the return light of the light beam irradiated by the optical recording medium -- 2 division photo detector -- receiving light -- difference -- it is characterized by preparing the above-mentioned pit or slot of two kinds of depths where the polarity according to the sense of a tracking gap of the push pull signal acquired from an output becomes reverse mutually, and changing.
[0015] Moreover, the regenerative apparatus of the optical recording medium concerning this invention In the regenerative apparatus which reproduces the optical recording medium which has either [at least] the pit record section where data were recorded with the gestalt of a pit, or the land record section where data are recorded on the land between the guide rails for tracking 2 division photo detector which receives the return light of the light beam irradiated by the above-mentioned optical recording medium by the light sensing portion carried out 2 ****s, It has the subtraction means which takes out the difference of the detecting signal from each light sensing portion of this 2 division photo detector as a push pull signal. As the above-mentioned optical recording medium What prepares the above-mentioned pit or slot of two kinds of depths where the polarity according to the sense of a tracking gap of the push pull signal acquired from the output of a subtraction means becomes reverse mutually, and changes is used. An above-mentioned technical problem is solved by carrying out sample hold of one side of the output from the above-mentioned subtraction means about the return light to the pit or slot of the two above-mentioned kinds of depths, and returning this sample hold output to an output from the above-mentioned subtraction means.
[0016] Furthermore, the regenerative apparatus of the optical recording medium concerning this invention In the regenerative apparatus which reproduces the optical recording medium which has either [at least] the pit record section where data were recorded with the gestalt of a pit, or the land record section where data are recorded on the land between the guide rails for tracking 2 division photo detector which receives the return light of the light beam irradiated by the above-mentioned optical recording medium by the light sensing portion carried out 2 ****s, It has the subtraction means which takes out the push pull signal of the difference of the detecting signal from each light sensing portion of this 2 division photo detector as a tracking error signal. As the above-mentioned optical recording

medium What prepares the above-mentioned pit or slot of two kinds of depths where the polarity according to the sense of a tracking gap of the push pull signal acquired from the output of a subtraction means becomes reverse mutually, and changes is used. The 1st and the 2nd sample hold means which carry out sample hold of the output from the above-mentioned subtraction means about the return light to the pit or slot of two kinds of these depths, respectively, An above-mentioned technical problem is solved by establishing an addition means to add the output from the these 1st and 2nd sample hold means, and removing the direct-current-offset component contained in an output signal from the above-mentioned subtraction means based on the output from this addition means.
[0017] Here, when setting the refractive index of the substrate of lambda and the above-mentioned optical recording medium to n for the above-mentioned light beam wavelength, it is the pit or depth of flute d1 of one of the two above-mentioned kinds of pits, or a slot of a class. It is referred to as 0<d1 <lambda / 4n, and is the pit or the depth of flute d2 of a class of another side. It is desirable to be referred to as lambda/4 n<d2 <lambda / 2n.
[0018]
[Function] The polarity of the truck gap component of the push pull signal (tracking error signal) of the return light from the 1st field in which the pit (or slot) of one depth was formed, Since the polarity of the truck gap component of the push pull signal of the return light from the 2nd field in which the pit (or slot) of the depth of another side was formed appears conversely mutually, by adding each of these push pull signals A truck gap component is offset and the so-called direct-current-offset component is taken out. Moreover, in the condition that the tracking servo has started, from control to which the above-mentioned push pull signal is set to 0 being performed, when the playback beam spot moves to the field of another side from one [of the above] 1st and 2nd field, the above-mentioned direct-current-offset component appears in a push pull signal. Thus, offset cancellation can be performed by subtracting the obtained direct-current-offset component from the above-mentioned push pull signal. Here, the tracking servo by which precision was stabilized highly is realizable by using a feedback configuration which performs direct-current-offset detection from the push pull signal with which offset cancellation was performed.
[0019]
[Example] Drawing 1 shows the outline configuration of the optical recording medium as one example of this invention. In this drawing 1 , the core of the recording track of an optical recording medium 10 is expressed in the truck center TC of an alternate long and short dash line, and record formation of the data is carried out as a pit 11 along this recording track (meeting in the direction of arrow-head T in drawing). The address part 18 in which the pit 16 where the pit depth differs in this optical recording medium 10 to the data division 13 by which record formation of the data pit 11 was carried out was formed is formed in some recording tracks. In addition, when using a disc-like optical disk as an optical recording medium 10, the direction of tracking control (the direction of arrow-head R) which intersects perpendicularly to the direction of a truck (the direction of arrow-head T, the tangential direction) of the recording track formed in the shape of a spiral (or concentric circular) is the direction of the diameter of a disk (the direction of Rade Al).
[0020] each depth dD of each above-mentioned pits 11 and 16, and dA So that it may mention later The return light of the light beam (laser beam) of the wavelength lambda irradiated by the optical recording medium 10 is received in 2 division photo detector. It is set up so that the polarity according to the sense of a tracking gap of the tracking error signal acquired as a difference partial output (the so-called push pull output) of the photodetection signal from each light sensing portion may become reverse mutually. For example, one side is set up within the limits of 0 - lambda/4, and another side is set up lambda / within the limits of 4 - lambda/2, respectively. Moreover, as for ratio (so-called groove ratio) beta/alpha of the pit width of face beta to a track pitch alpha, it is desirable that set up one side within the limits of 0 - 1/2 (it is smallness from one half), and it sets up another side within the limits of 1/1 (it is size from one half). [2-1]
[0021] Each depth dD of each above-mentioned pits 11 and 16, and dA The boundary value lambda of the range / 4, and lambda / 2 grades are expressed more to accuracy like lambda/4n and lambda/2n using

the refractive index n of the substrate of an optical recording medium 10. Actually, since the refractive index n of a substrate is close to 1, Above lambda / 4, and lambda / 2 grades are enough as it practically. here -- the depth dD of the above-mentioned pit 11 And the depth dA of a pit 16 ******** -- each condition -- lambda/4<dD -- < -- lambda/2 and 0<dA -- it is desirable to be referred to as <lambda/4 (correctly lambda/4n<dD <lambda / 2n, and 0<dA <lambda / 4n). As an example of these depth d1 and the concrete numeric value of d2, it is dD=3lambda / 8 (3lambda/8n is sufficient.). dA =lambda/8 are mentioned like the following. Moreover, as other examples, dD =lambda/3, and dA =lambda/6 are mentioned. Furthermore, the same result is obtained even if it adds N lambda/n (N is an integer) or lambda/2n of N to these numeric values. As above-mentioned groove ratio beta/alpha, setting data division 13 (pit 11) to two thirds, and setting address part 18 (pit 16) to one third is mentioned.
[0022] The important section (a near tracking servo system) of the regenerative apparatus used in order to reproduce the optical recording media 10, such as such an optical disk, is shown in drawing 2 . In this drawing 2 , the photodetection signal from each light sensing portions 35A and 35B of 2 division photo detector (photodetector) 35 is sent to the differential amplifier (subtractor) 36, and the push pull output signal Ipp as the so-called tracking error signal is acquired by taking difference.
[0023] The push pull signal Ipp which is this tracking error signal is sent to an adder (subtractor) 41, and the output signal from this subtractor 41 is sent to a subtractor 41 as a subtraction signal through a low pass filter (LPF) 42, the sample hold (S/H) circuit 43, and the gain amplifier (multiplier multiplier) 45 (negative feedback is carried out). The sampling pulse from a terminal 44 is supplied to the sample hold (S/H) circuit 43, and a sample hold circuit 43 carries out the sample of the output from the low pass filter 42 in the address part 18 of above-mentioned drawing 1 , and is held.
[0024] The output signal from a subtractor 41 is sent to the jogging actuator 39 for tracking control through drive amplifier through the phase compensating circuit 38 at least in that of a tracking servo loop. As this jogging actuator, so-called tracking mechanical component, so-called galvanomirror mechanical component, etc. of a biaxial device are used. Moreover, the output signal from a sample hold circuit 43 is sent to the coarse adjustment actuator 49 through drive amplifier through the phase compensating circuit 48. As this coarse adjustment actuator 49, the so-called threading motor, a linear tracking motor, etc. are used.
[0025] Although actuation of the circuit of this drawing 2 is explained to a detail also later, if fundamental actuation is explained, first, tracking servo control action acts so that the push pull signal Ipp may be set to 0, and the push pull signal Ipp has become **** 0 by the steady state. With the optical recording media 10, such as a common optical disk, since the rate of data division 13 is fully large compared with address part 18, tracking servo control action is considered that control is performed so that a line crack and the push pull signal Ipp in these data division 13 may be set to 0 to the truck of data division 13. However, when the offset accompanying said objective lens migration etc. has arisen, offset has ridden on the push pull signal Ipp itself, and the location gap for the above-mentioned offset (however, reverse sense) will have produced the beam spot on a medium to the truck core (TC) by performing the servo which sets to 0 the push pull signal Ipp with which this offset rode. If the push pull signal Ipp in data division 13 and address part 18 is taken into consideration, here so that it may mention later The truck gap component in data division 13 and the truck gap component in address part 18 serve as reversed polarity (opposite phase) mutually. Since the offset component accompanying the above-mentioned objective lens migration etc. serves as like-pole nature, the direct current level by which what was set to 0 by data division 13 is equivalent to the location gap for the above-mentioned offset when the beam spot moves to address part 18 will appear. The above-mentioned offset component in the push pull signal Ipp is canceled by carrying out the sample of this, holding it in a sample hold circuit 43, carrying out the multiplication of the required multiplier K with the gain amplifier 45, and sending to a subtractor 41. In addition, the condition of not being completed as 0 by data division 13, either also has the above-mentioned push pull signal Ipp actually.
[0026] Here, the reflected light when a laser beam is generally irradiated to a pit or a slot (groove) is explained, referring to drawing 3 . In the optical recording medium 30 shown in this drawing 3 , when setting width of face of alpha and a pit (or slot) 31 to beta for a track pitch and an exposure light spot

serves as track pitch alpha extent, a pit (or slot) 31 looks like the so-called diffraction grating. For this reason, the intensity distribution of the reflective beam spot will change with the cross protection by truck gap in the field with which the zero-order diffracted light DF 0, and the primary diffracted-light DF+1 (primary [+] order [1st / -]) and DF-1 lap. Change of the optical intensity distribution by this interference can be led to the photo detector (photodetector) 35 divided into two through an objective lens 34, and a tracking error signal can be taken out by sending the photodetection signal from each light sensing portions 35A and 35B to the differential amplifier (subtractor) 36, and taking difference. Moreover, a sum signal and the so-called RF output signal can be acquired by sending and adding the photodetection signal from each light sensing portions 35A and 35B to a summing amplifier (adder) 37.
[0027] In this drawing 3 , when a light beam and an optical recording medium 30 move in the direction (direction which intersects perpendicularly to the direction of arrow-head T which is the truck extension direction) of arrow-head R which is the direction of tracking relatively the detecting signal I0 of the above-mentioned zero-order one from one light sensing portion 35A of a photo detector 35, and the primary [+] flux of light, and +1 (t) the detecting signal I0 of the above-mentioned zero-order one from light sensing portion 35B of another side, and the primary [-] flux of light, and -1 (t) I0 and +1 (t) =A0 2+A1 2+2A0 A1 cos(psi10+2pinut) I0 and -1 (t) It is expressed like =A0 2+A1 2+2A0 A1 cos (psi10-2pinut). Here, it is A0. The zero-order light amplitude and A1 The phase according [accord / primary light amplitude and psi 10 / the phase contrast between zero-order / primary / -/ 2pinut] to the location gap between a medium and an optical spot is shown, respectively. Moreover, time of day t is setting timing of the mid gear (core of a land) between pits (or slot) 31 to t= 0.
[0028] Therefore, the difference signal (the so-called push pull signal) Ipp from the above-mentioned differential amplifier (subtractor) 36 is Ipp=I0 and +1 (t). - I0 and -1(t) =2A0 A1 (cos (psi10+2pinut)-cos (psi10-2pinut))
= -4A0A1 It is set to sin psi10 sin2pinut. This push pull signal Ipp is also a tracking error signal. Moreover, the sum signal (the so-called RF signal) IRF from the above-mentioned summing amplifier (adder) 37 is IRF=I0 and +1 (t). +I0 and -1(t) =2A0 2+2A1 2+4A0 A1 It is set to cos psi10 cos2pinut.
[0029] the relation of the phase contrast psi 10 between above-mentioned [to depth d of the above-mentioned slot 31] zero-order [primary / -] is like [when setting ratio (so-called groove ratio) of width of face beta of pit (or slot) 31 to above-mentioned track pitch alpha to s (= beta/alpha) now] drawing 4 by the so-called Hopkins theory -- a table is carried out. This drawing 4 R> 4 shows the example of s=1/3, s=1/2, and s=2/3.
[0030] Since it is reversed according to the polarity of sin psi10, the polarity of the above-mentioned push pull signal (tracking error signal) Ipp turns into a reverse polarity mutually in the range of 0 - lambda/4n, and lambda / 4 n-lambda / the range of 2n, so that clearly from this drawing 4 . That is, for example at the time of s(= beta/alpha) =1/3, in 0 - lambda/4n, sin psi10 serves as straight polarity, and sin psi10 serves as negative polarity lambda / 4 n-lambda / in 2n.
[0031] Therefore, in the pit record which records data with the gestalt of a pit, the relation between the polarity of the above-mentioned push pull signal Ipp over the sense of the truck gap from a truck core (above TC) and the polarity of said direct current offset by gap of an objective lens becomes the same by setting up depth d of a pit within the limits of lambda/4n-lambda / 2n. In addition, in land record which records data on the land between guide rails, the relation between the polarity of the direct current offset by gap of an objective lens and the polarity of the error component by the tracking gap near the truck center TC becomes the same by setting up depth d of a guide rail within the limits of 0 - lambda/4n.
[0032] That is, drawing 5 is drawing for explaining the example of the above-mentioned push pull signal Ipp at the time of moving the beam spot in the direction (the direction of arrow-head R) which intersects perpendicularly with a truck by migration of an optical head, for example, an objective lens, in the above-mentioned pit record. A of this drawing 5 shows the important section of the optical recording medium 10 (30 of drawing 3) of the pit record type shown in above-mentioned drawing 1 , and record formation of the data is carried out with the pit 11 or the gestalt of 16 (31 of drawing 3) on the recording track (TC shows the core.). The depth dD of the pit 11 in the data division 13 of above-mentioned drawing 1 (data pit) As mentioned above, it has set to lambda / within the limits of 4 -

lambda/2 (correctly lambda / 4 n-lambda / 2n), for example, lambda/8, and lambda / 3 grades. Moreover, the depth dA of the pit 16 in the above-mentioned address part 18 (address pit) As mentioned above, it has set to within the limits of 0 - lambda/4 (correctly 0 - lambda/4n), for example, 3lambda/8, and lambda / 6 grades. When making it move so that a recording track may be crossed for the beam spot along with Curve MV on this optical recording medium 10 (30) by the optical head, the above-mentioned push pull signal Ipp appears like B of drawing 5 . The time of the curve Sa which shows the time of the curve Sd shown in the continuous line of B of this drawing 5 crossing the above-mentioned data pit 11, and moving to an imaginary line (two-dot chain line) crossing the above-mentioned address pit 16, and moving is shown, respectively.

[0033] In the signal wave form curve Sd corresponding to the above-mentioned data pit 11 of the push pull signals Ipp of B of this drawing 5 , when the sense of a tracking gap near the truck center TC of A of drawing 5 is a method of drawing Nakagami, it has appeared in the forward side at the negative side, respectively at the time of the method of drawing Nakashita. Or when the direction of change of a tracking gap near the truck center TC is upward, the curve Sd of Signal Ipp serves as an upward slant to the right (forward inclination), and when the direction of change is downward, as for the curve Sd of Signal Ipp, the lower right serves as ** (negative inclination). Here, about the offset component by migration of the objective lens for moving the beam spot in the direction (the direction of arrow-head R) which intersects perpendicularly with a truck, as shown in the curve OF of the broken line of B of drawing 5 , it changes to an upward slant to the right at the time of the upper part [sense / of migration of the above-mentioned beam spot] in A of drawing 5 (an inclination serving as forward), and when the sense of migration is a lower part, the lower right changes to ** (an inclination serves as negative). namely, when the depth detects the push pull signal Ipp (tracking error signal) within the data division 13 in which lambda / pit 11 of 4 - lambda/2 within the limits was formed The polarity of the tracking gap component according to the sense (or the direction of change) of the tracking gap near the truck center TC since the above sin psi10 serves as straight polarity (or inclination), The polarity (or inclination) of the offset component according to the migration location (or sense of migration) of the beam spot by objective lens migration becomes the same.

[0034] Thus, the stable tracking servo becomes possible, without being generated with [of the above-mentioned jogging actuator] a beam by making in agreement the sense of conversion of an original tracking error component and the sense of change of the above-mentioned offset component by tracking gap.

[0035] on the other hand, the depth d2 of the pit 16 in the above-mentioned address part 18 (address pit) Since it is set up within the limits of 0 - lambda/4 as mentioned above, and the above sin psi10 serves as straight polarity, The relation between the polarity of Curve Sa shown in the imaginary line (two-dot chain line) of the push pull signal Ipp according to the sense of a tracking gap near [which is the core of a pit 16] the truck center TC, and the polarity of the push pull signal Ipp according to the migration direction of the beam spot in the reverse sense becomes. Since this address part 18 is short formed to the above-mentioned data division 13, it is rare to have bad influences, such as with [of the above-mentioned jogging actuator] a beam, and there is also little degradation of the stability of a tracking servo.

[0036] Although various approaches can be considered to form two kinds of pits 11 and 16 of mutually different depth d and width of face (groove ratio beta/alpha) as shown in above-mentioned drawing 1 , an example of the manufacture approach in the case of depth dA =lambda of depth dD =3lambda/8 of pit 11, groove ratio 2/3, and pit 16/8 and the groove ratios 1/3 is explained below, for example.

[0037] First, what is necessary is to apply the photoresist for the depth 3lambda/8 to a medium substrate, to control the laser power for resist exposure to two steps, to form the pit 16 of lambda/8 of the address part 18 by weak power, and just to form the pit 11 of the data division 13 of 3lambda/8 by strong laser power. At this time, since the groove ratio of address part 18 becomes smaller than the groove ratio of data division 13 inevitably, it is thought appropriate to make the groove ratio of data division 13 about into 2/3, and to make the groove ratio of address part 18 about into 1/3.

[0038] Next, the offset cancellation actuation in the tracking servo system of the circuitry of above-

mentioned drawing 2 is explained.
[0039] Since 180 degrees of phases of the above-mentioned push pull signal Ipp from the above-mentioned data division (drawing 1) 13 and address part 18 are reversed, offset cancellation will be performed by the feedback loop, if a servo loop with which both signals balance focusing on 0V is constituted and a tracking error signal is taken out from the middle of this loop formation. That is, if offset rides on the push pull signal Ipp in the above-mentioned data division 13 and address part 18, offset will ride on the whole and the balance of each signal of data division 13 and address part 18 will collapse. It is the principle of operation of the circuit of drawing 2 to detect this and to make it balance compulsorily by the feedback loop. Thus, offset is canceled by controlling so that the push pull signal Ipp balances by the above-mentioned data division 13 and address part 18. This method is considered that it can carry out offset cancellation to **** completeness if about 40dB of loop gains is obtained since the amount of offset becomes small in proportion to a loop gain.
[0040] Address part 18 is also an offset cancellation field, and the depth may form the slot whose groove ratio (beta/alpha) is about 1/3 within the limits of 0 - lambda/4. Although the address-data component at the time of using address part 18 hardly leaks to the above-mentioned push pull signal Ipp theoretically, the push pull signal Ipp becomes quite dirty by the leakage lump by optical system etc. However, since this leakage lump address component is a signal which positive/negative cancels, he is trying for a low pass filter (LPF) 42 to remove.
[0041] Therefore, if offset cancellation is performed using a circuit like drawing 2 , since the feedback method is performing offset cancellation of the tracking error signal which a low band servo signal is sufficient as, and is added to the jogging actuator 39 since the cancellation signal has been acquired in the whole field of address part 18, there are few errors and there is little so-called DETORAKKU. Since offset cancellation has not been carried out by addition like before compared with the this offset-amendment method using the conventional mirror section, the nonlinearity over parameter change of a medium or bias of the amount of offset does not grow into a problem, but it is accurate. Moreover, since it is not necessary to detect the narrow mirror section, broadband amplifier is not needed, but low offset amplifier can be used at low cost. Furthermore, the band of the coarse adjustment actuator 49 can be set to about 200Hz by controlling so that the variation rate of the jogging actuator 39 is set to 0 with the coarse adjustment actuator 49, and following the outside of the control range of the coarse adjustment actuator 49 with the jogging actuator 39 by constituting so that the tracking error signal added to the jogging actuator 39 may be added to the drive system of the coarse adjustment actuator 49 through an integrating circuit.
[0042] Moreover, since the optical recording medium 10 while canceling offset by circuit like drawing 2 , as shown in above-mentioned drawing 1 which a tracking servo can perform can be easily performed to the so-called stamping and fits fertilization, the price of it can fall.
[0043] Next, drawing 6 is the block circuit diagram showing roughly the important section configuration of the regenerative apparatus of the optical recording medium which uses such an optical recording medium, and shows the more concrete configuration of the circuit of above-mentioned drawing 2 . The same directions sign is given to each part of above-mentioned drawing 2 in this drawing 6 , and a corresponding part.
[0044] In this drawing 6 , the push pull signal Ipp (tracking error signal) acquired from the differential amplifier (subtractor) 36 of above-mentioned drawing 2 (or drawing 3 R> 3) is sent to the adder (subtractor) 41 which consists of the differential amplifier. The output signal from a subtractor 41 is sent to the above-mentioned sample hold (S/H) circuit 43 which consists of switch 43a and capacitor 43for hold b through buffer amplifier through the low pass filter (LPF) 42 which consists of resistance and a capacitor. The output signal from capacitor 43for hold b of this sample hold circuit is sent to the inversed input terminal of the differential amplifier of a subtractor 41 as a subtraction signal through the gain amplifier 45. The sampling pulse from a terminal 44 turns on/controls [off] switch 43a of the above-mentioned sample hold circuit. The level by which turned on switch 43a within the above-mentioned address part 18, and carries out the sample of the level of the push pull signal Ipp within this address part 18, and the sample was carried out is held by capacitor 43b, and this sampling pulse is sent

to the gain amplifier 45. In addition, unless it puts in the gain amplifier 45, only 10dB of gain is not acquired by the sample clinch. The output signal from this gain amplifier 45 is the above-mentioned direct current offset, and is sent to coarse adjustment actuators, such as a threading motor mentioned above while being sent to the subtractor 41.
[0045] Here, the above-mentioned push pull signal Ipp is sent to a differential circuit or a high-pass filter 51, a high-frequency component is taken out, and detection of the above-mentioned address part 18 (start point) is performed by being compared on predetermined level in a comparator circuit 52. This address part detecting signal is sent to two steps of so-called retriggerable mono-multi circuits 53 and 54, and from these mono-multi circuits 53 and 54, while scanning the above-mentioned address part 18, a pulse signal which serves as "H" (high-level) is outputted. The pulse signal from the mono-multi circuit 54 is sent to switch 43a of the above-mentioned sample hold circuit through a terminal 44. The pulse signal from the mono-multi circuit 53 is sent as a change-over control signal of a change-over switch 56. namely, the output signal from the above-mentioned subtractor 41 -- LPF (integrating circuit) 57 of the 1st time constant -- minding -- the selected terminal a of a change-over switch 56 -- moreover, it is sent to the selected terminal of a change-over switch 56 through LPF (integrating circuit)58 of the 2nd time constant, respectively, and while scanning the above-mentioned data division 13 and scanning the above-mentioned address part 18 for the selected terminal a, change-over connection is made at the selected terminal b, respectively. The output signal from this change-over switch 56 is sent to jogging actuators, such as a coil for tracking of the above-mentioned biaxial device, through buffer amplifier etc.

[0046] The time constant of LPF57 is set as the comparatively small value of the band where general tracking servo actuation is performed, and the time constant of LPF58 is set as the value with big extent holding the tracking error level in the data division 13 in front of address part 18 so that there may be little fluctuation also in a scan about the above-mentioned address part 18. By this, the tracking error signal sent to a jogging actuator turns into a smooth signal without the level variation by the switch to address part 18 from data division 13 from a change-over switch 56.
[0047] Next, drawing 7 shows the example of the so-called land record type which records data on the land 22 between guide rails 21 of optical recording medium 20. The offset cancellation field 28 in which the slot 26 which has the depth on the truck of this optical recording medium 20 which is different in a guide rail 21 to a field in part, and width of face (groove ratio beta/alpha) was formed is formed. That is, sequential arrangement of data division 23 and the offset cancellation field 28 is carried out along the truck. the guide rail 21 of data division 23 -- the depth dD ****** -- 0<dD -- <lambda / 4n, and a groove ratio (beta/alpha) consider as smallness from one half, and it is [the slot 26 of the offset cancellation field 28] desirable as the depth dOF that lambda / 4 n<dOF<lambda / 2n, and a groove ratio consider as size from one half. As an example, it is the depth dD of a guide rail 21. Setting lambda/8n and a groove ratio to one third, and setting 3lambda/8n and a groove ratio to two thirds for the depth dOF of a slot 26 is mentioned. As other examples, it is dD. Setting lambda/5n and dOF to lambda/3n is mentioned, and it may add N lambda/n (N is an integer) or lambda/2n of N to each of these numeric values further.
[0048] The tracking servo by which precision was stabilized well is realizable like the case of the optical recording medium 10 above-mentioned pit (or groove) record type, also in the case of such a land record type optical recording medium 20, fertilization of a medium is possible, and a cost cut can plan to it. In addition, you may make it make information, such as the address and an index, bear by separating and forming the slot 26 in the offset cancellation field 28 in the direction of a truck (it forming in the shape of a pit).
[0049] Next, drawing 8 shows other examples of offset cancellation of a tracking error signal. In this drawing 8 , the push pull signal Ipp which took the difference of the detecting signal from each light sensing portion of 2 division photo detector mentioned above, and was acquired is sent to the 1st sample hold circuit 81 and 2nd sample hold circuit 82, respectively. The sample of the 1st sample hold circuit 81 is carried out, it holds the push pull signal Ipp in a just before [the address part in the above-mentioned data division (or offset cancellation field)] location, and within address part (offset cancellation field), the 2nd sample hold circuit 82 carries out the sample of the push pull signal Ipp, and

holds it. Since a truck gap component appears in reversed polarity and an offset component appears in like-pole nature mutually, respectively as the push pull signal Ipp in these each part was explained with above-mentioned drawing 5 , by adding the output from each sample hold circuits 81 and 82 with an adder 83, a truck gap component is offset and only an offset component is obtained (however, level twice). the tracking error signal with which the offset component was removed by carrying out sample hold of the output from this adder 83 suitably in a sample hold circuit 84, decreasing to one half with the attenuation amplifier (multiplier multiplier) 85, and subtracting from delivery and the original above-mentioned push pull signal Ipp to a subtractor 86 -- taking -- coming out -- last ** This tracking error signal by which offset cancellation was carried out is sent to the above-mentioned jogging actuator.
[0050] In addition, this invention is not limited only to the above-mentioned example, and the above-mentioned pit (groove) record section and the land record section may be intermingled on one optical recording medium. Moreover, as a jogging actuator, a galvanomirror etc. can be used other than the so-called biaxial device. Furthermore, as an optical recording medium, it is not limited to a disk-like thing, but can apply to the medium of various gestalten, such as the shape of the shape of a tape, and a card. In addition, of course in the range which does not deviate from the summary of this invention, various modification is possible.
[0051]
[Effect of the Invention] According to the optical recording medium concerning this invention, so that clearly also from the above explanation The depth of a slot [the pit of two kinds of depths where the polarity according to the sense of a tracking gap of the tracking error signal acquired as the so-called push pull signal from 2 division photo detector becomes reverse mutually, or], one [i.e.,], by 0 - lambda/4n In case two kinds of pits or a slot where the depth of another side becomes lambda / 4 n- lambda / 2n is prepared and such an optical recording medium is reproduced Since sample hold of one side of the above-mentioned push pull output about the return light to the pit or slot of the two above-mentioned kinds of depths was carried out and this sample hold output is returned to the above-mentioned push pull output, The polarity of the truck gap component of the push pull signal (tracking error signal) of the return light from the 1st field in which the pit (or slot) of one depth was formed, Since the polarity of the truck gap component of the push pull signal of the return light from the 2nd field in which the pit (or slot) of the depth of another side was formed appears conversely mutually, by adding each of these push pull signals A truck gap component is offset and the so-called direct-current-offset component is taken out. Moreover, in the condition that the tracking servo has started, from control to which the above-mentioned push pull signal is set to 0 being performed, when the playback beam spot moves to the field of another side from one [of the above] 1st and 2nd field, the above-mentioned direct-current-offset component appears in a push pull signal. Thus, offset cancellation can be performed by subtracting the obtained direct-current-offset component from the above-mentioned push pull signal. Here, the tracking servo by which precision was stabilized highly is realizable by using a feedback configuration which performs direct-current-offset detection from the push pull signal with which offset cancellation was performed.
[0052] Furthermore, the stable tracking servo which is not produced with [of a jogging actuator] a beam etc. can be performed by setting it as the above-mentioned pit or the depth of flute which makes in agreement the relation between the polarity of the tracking gap component according to the sense of the tracking gap near [of a recording track] the core of the above-mentioned push pull signal, and the polarity of the offset component according to the sense of migration of the direction which intersects perpendicularly with the truck of the optical beam spot.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the top view showing roughly the important section of the example of the optical recording medium concerning this invention.
[Drawing 2] It is the block diagram showing roughly the important section configuration of the example of the regenerative apparatus of the optical recording medium concerning this invention.
[Drawing 3] It is drawing for explaining the tracking error detection principle by the reflected light from an optical recording medium.
[Drawing 4] It is the graph which shows the relation between the depth of the slot on the optical recording medium (pit), and the phase contrast between the primary [-] zero-order diffracted lights.
[Drawing 5] It is drawing for explaining the push pull signal which receives the optical recording medium used as the example of this invention, and its return light by 2 division photo detector, and is acquired.
[Drawing 6] It is the block circuit diagram showing the example of the important section configuration of the example of the regenerative apparatus of the optical recording medium concerning this invention.
[Drawing 7] It is the top view showing roughly the important section of the land record type optical recording medium used as the example of this invention.
[Drawing 8] It is the block diagram showing the outline configuration of the important section of the regenerative apparatus of the optical recording medium used as other examples of this invention.
[Drawing 9] It is drawing for explaining the offset by migration of an objective lens.
[Drawing 10] It is drawing showing a pit record type optical recording medium.
[Drawing 11] It is drawing showing a land record type optical recording medium.
[Description of Notations]
10 30 ..... Optical recording medium
11 16 ..... Pit
13 23 ..... Data division
18 ..... Address part
31 ..... A pit or slot
34 ..... Objective lens
35 ..... 2 division photo detector
36 ..... Differential amplifier (subtractor)
37 ..... Summing amplifier (adder)
41 ..... Subtractor
42 ..... LPF (low pass filter)
43 ..... Sample hold circuit

[Translation done.]

* NOTICES *

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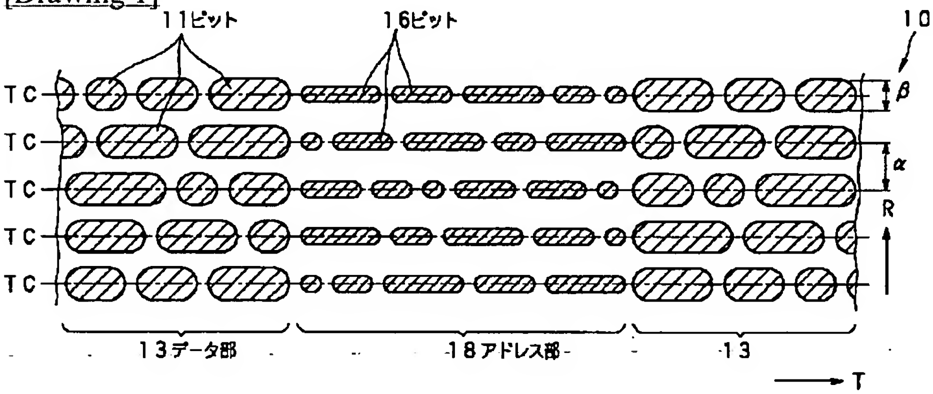
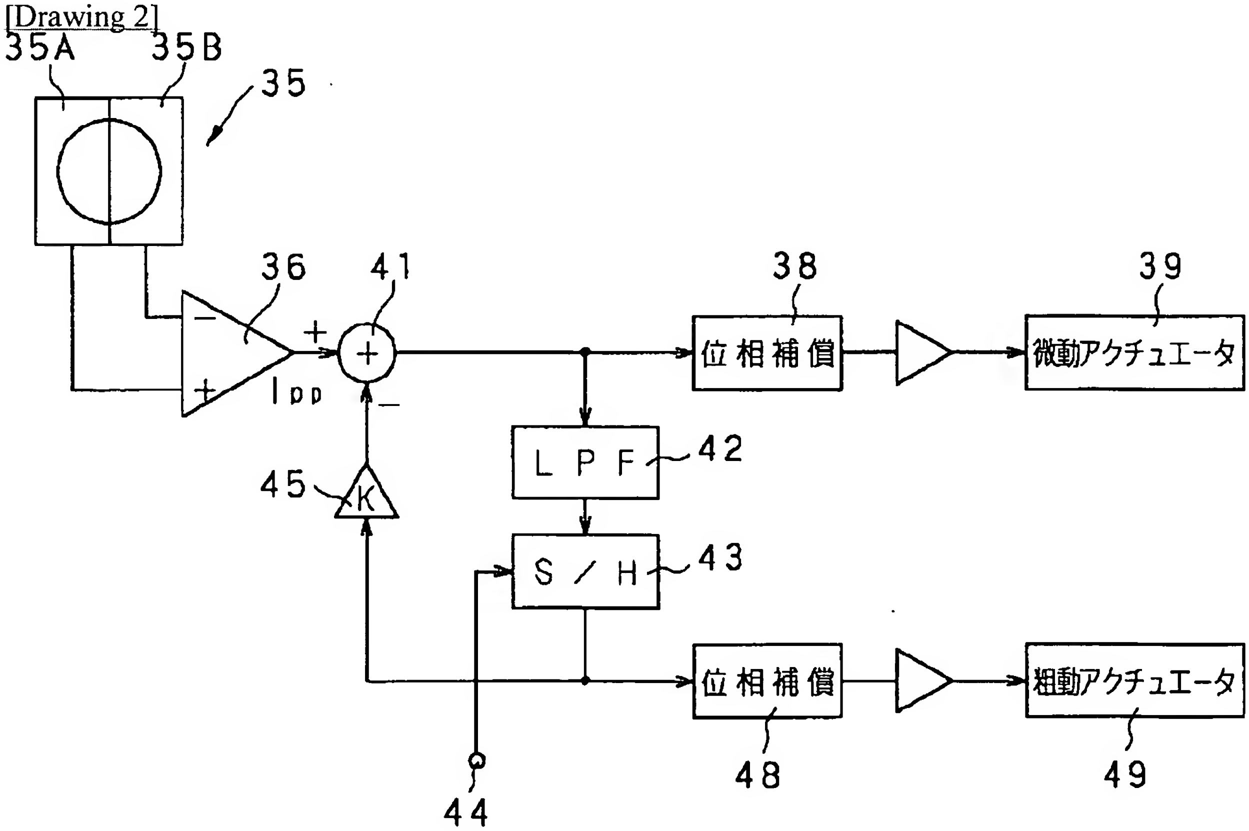
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

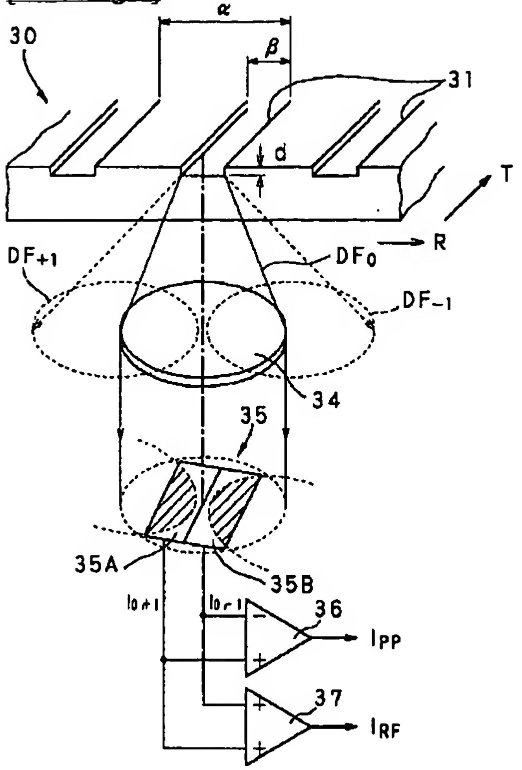
[Drawing 1]



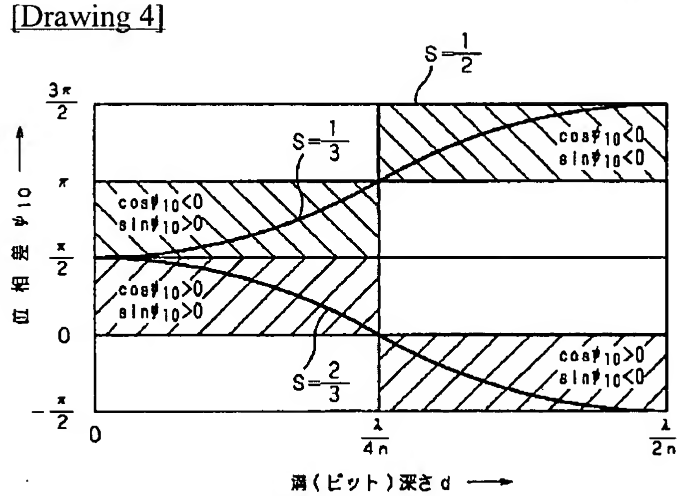
[Drawing 2]



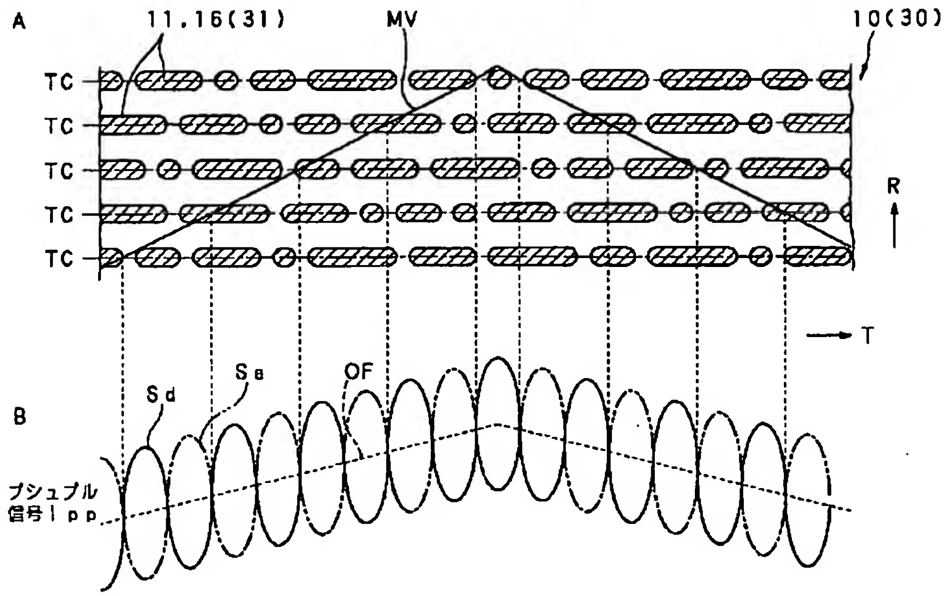
[Drawing 3]



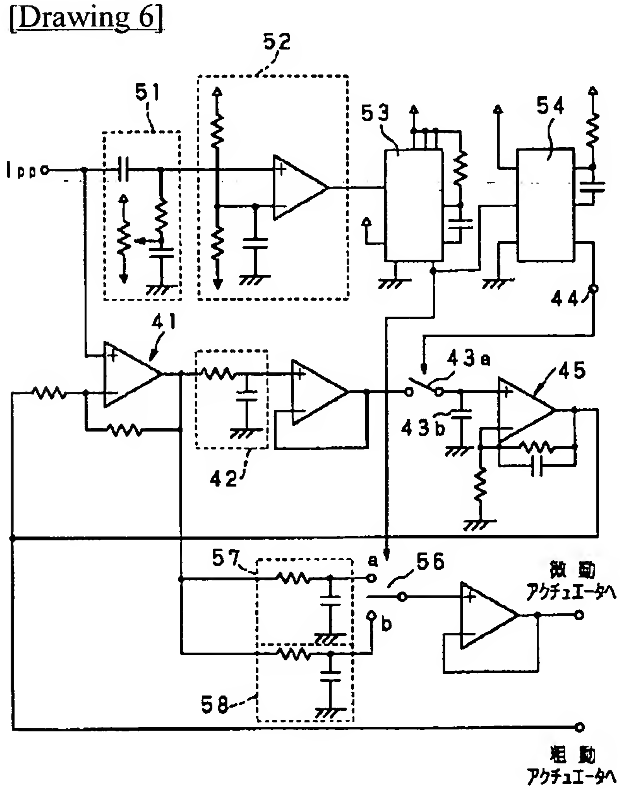
[Drawing 4]



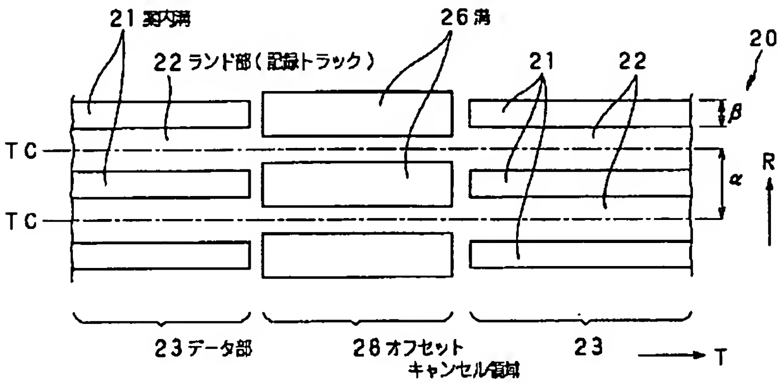
[Drawing 5]



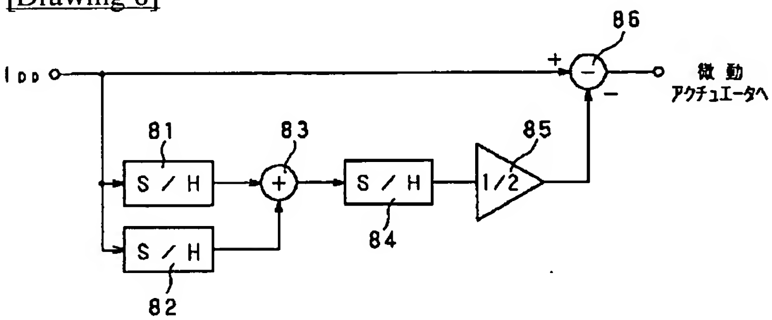
[Drawing 6]



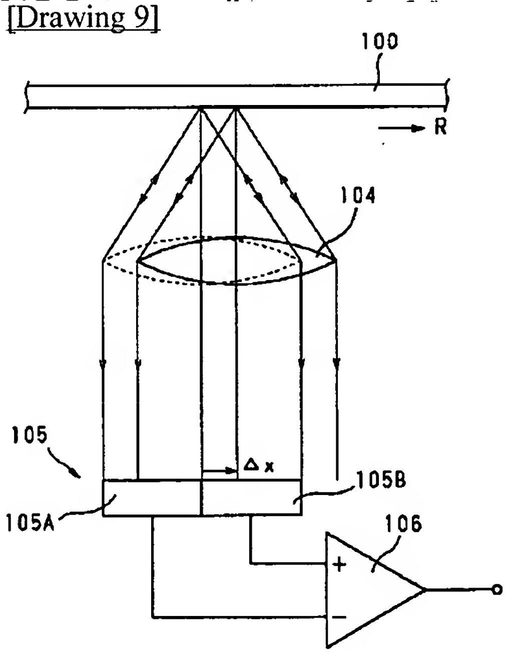
[Drawing 7]



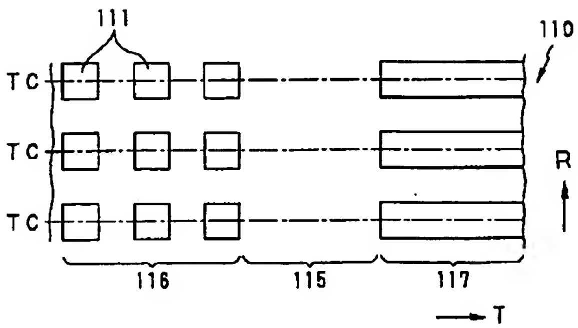
[Drawing 8]



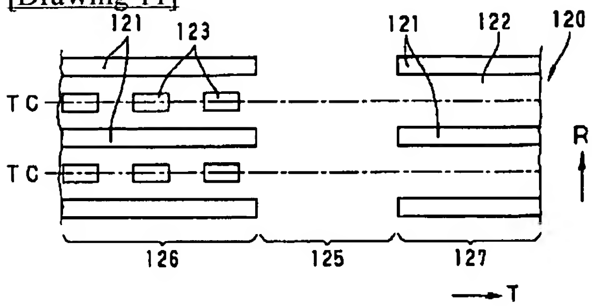
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]